PROJECT GRANT

APPLICATION FORM

1. Project title	**The continuation of the West African Fruit Fly Initiative** (WAFFI) **into 2010.**
2. Themes 2 and 3	- Theme 2 (Capacity building for public and private organizations, notably with respect to market access). - Theme 3 (Information sharing on standards and coordination) of technical co-operation activities).
3. Starting date	01.03.2010
4. Completion date	28.02.2011
5. Requesting organization(s)	CIRAD (Centre de Coopération Internationale en Recherche Agronomique pour le Développement) Address Headquarter : CIRAD, 42 rue Scheffer, 75116 PARIS (France) Tel : +33 1 53 70 20 00 Site internet : www.cirad.fr Department : CIRAD PERSYST TA B-DIR / 09, 34398 Montpellier Cedex 5 (France) Tel : +33 4 67 61 58 00 Email: dirpersyst@cirad.fr Relevant contact person : Dr Jean-François VAYSSIERES IITA - Biological Control Centre for Africa - 08 BP 0932, Tri postal - Cotonou (Benin) Tel : +229 21 35 01 88 ext. 242 - Fax: +229 21 35 05 56 Email: jean-francois.vayssieres@cirad.fr or J.Vayssieres@cgiar.org **Appendix 1**: cf the request of the 15 countries of ECOWAS (Meeting at Bamako, the 30th of September 2009). Please, see this request in attached file
6. Implementing organization(s)	CIRAD (Centre de Coopération Internationale en Recherche Agronomique pour le Développement) Address Headquarter : CIRAD, 42 rue Scheffer, 75116 PARIS (France)

	Tel : +33 1 53 70 20 00 Site internet : www.cirad.fr Department : CIRAD PERSYST TA B-DIR / 09, 34398 Montpellier Cedex 5 (France) Tel : +33 4 67 61 58 00 Email: dirpersyst@cirad.fr **Appendix 2** : cf mail of CIRAD STDF partner: WB (The World Bank) 1818 h Street, N.W. Washington, D.C. 20433 USA Relevant contact person : Christophe RAVRY Senior Agribusiness Specialist Africa Region The World Bank 1818 H Street, NW Washington, DC 20433, USA Tel. 202-473.67.51 Email: cravry@worldbank.org
7. Project background and rationale	**Appendix 3 :** in attach
8. Project management	**Appendix 4 :** in attach
9. Project objectives	**Appendix 5 :** in attach
10. Project outputs	**Appendix 5 :** in attach
11. Project activities	**Appendix 5 :** in attach (**Appendix 6**) (cf appendix 5, 7, 8)
12. Timetable	**Appendix 7** : in attach
13. Private/public sector co-operation	Detail the arrangements for public/private sector co-operation, if any, in the project.
14. Budget	**Appendix 8 :** in attach (**Appendix 9**) non applicable (**Appendix 10**) non applicable.

15. Non STDF contributions	**W.B**……. 83 487 US $ **CIRAD**…….. 205 500 US $

THE CONTINUATION OF THE WEST AFRICAN FRUIT

FLY INITIATIVE (WAFFI) INTO 2010

APPENDIX 3: Background and rationale for 2010 (Phase 3)

1. BACKGROUND

Fruit flies have become an increasingly prevalent pest of fruit productions in most West African countries, affecting not only the burgeoning mango export industry, but also other important fruit species like Citrus that matter for domestic consumption.

A new species, *Bactrocera invadens*, which originated from Sri Lanka and migrated westward across sub-Saharan Africa, is now prevalent in most West African countries. Since this species is particularly phytophagous and prolific, it has tended to displace endogenous species (Vayssières et al, 2005; Ekesi et al, 2009) and consequently is causing increased damages to fruit productions (Vayssières et al, 2009). The phenomenon has reached such proportions, and the economic impact has become so serious, that international development agencies together with the plant protection agencies of the concerned countries have started exploring ways to bring a regional response to this regional threat.

In late 2007, the European Union commissioned a team of experts to do a scoping study on the damages inflicted by fruit flies on West Africa fruit production[1] together with the design of an Action Plan for a coordinated regional response. In addition, a few bilateral donors have been involved in the fight against this plague in specific countries (e.g. USAID in Senegal and Ghana) but there had been no attempt, so far, at bringing a regional response given the sheer magnitude of the task and the large resources that would have to be mobilized for a significant impact to be felt.

In early 2007, a study on the extent of the damage inflicted on fruit production by fruit flies was commissioned at the request of the Member States of the Economic Community of West African States (ECOWAS/CEDEAO) and conducted with European funding by the consultancy firm Italtrend. The conclusions of this study were submitted in April 2008. They are based on an analysis of abundant literature on the subject and on interviews with over 300 stakeholders in field visits to eight fruit producing countries in West Africa (Côte d'Ivoire, Senegal, Mali, Burkina Faso, Ghana, Guinea, Gambia and Benin). Based on the information collected, the study provided an estimate of the damage caused by fruit fly to the fruit and vegetable industries in West Africa, and recommended various pest management methods to reduce and prevent these losses. This study was also able to identify specific problems related to fruit fly damage at national level, as well as selected solutions applied in certain countries to combat this pest. Finally, the report proposed specific actions in the form of a Regional Action Plan, accompanied by a logical framework with specific activities to be conducted at regional and national level.

Under the auspices of the ECOWAS Commission, a Regional Workshop was held in Bamako, Mali, from 29 July to 1 August 2008, which approved the results of the study with a few minor amendments. One of the key recommendations requested by participants was to take the necessary steps to mobilize donor resources for this Regional Action Plan in a coordinated manner so as to avoid duplication of effort and achieve tangible and effective results.

However, it was noted that the Italtrend study had several shortcomings and did not consider important items, namely:
• The breakdown of actions at regional and national level and the linkages between the two levels were only briefly outlined;
• the implementation rationale required further elaboration to ensure that all the links necessary for the complete success of the Programme be taken into account;
• the budgetary aspect was lacking, since the cost of the planned actions was not indicated;
• the institutional operating set-up and implementation rationale were not mentioned, although these are crucial elements for the success of a programme;
• since the intention is to replicate the West African Regional Programme in other regions of the African continent, it is essential that all of its implementation modalities be properly defined.

Accordingly, the World Bank, using funds available in the EU funded Trust Fund, and the STDF/WTO, agreed as part of their 2009 activity programme to co-finance a

[1] This report, known as the Italtrend Report (after the name of the consultancy firm which was commissioned by the EC) covered Benin, Burkina Faso, Gambia, Ghana, Guinea, Ivory Coast, Mali and Senegal.

complement to the Italtrend study. The complementary study was led by COLEACP and addresses the issues outlined above, i.e. estimating costs of a Regional Action Plan to control fruit fly as well as proposing a viable institutional implementation mechanism to carry out the plan.

A total of 87 participants were gathered in Bamako, Mali on 29-30 September 2009 to validate the COLEACP report. The meeting was co-hosted by the Economic Commission of West African States (ECOWAS), the Standards and Trade Development Facility (STDF) and the Government of Mali. The meeting was part of a regional dynamic to implement the ECOWAS Agricultural Policy (ECOWAP) in line with the African Union's CAADP/ NEPAD Process with specific emphasis on fruit fly. The specific objective of the workshop was to sensitize stakeholders, including representatives from Government, the private sector, civil society, research institutions and development partners, on proposed budgeted actions required to implement the 5- year regional action plan and suggest an institutional framework to implement it. Participants agreed on the action plan and the workshop resulted in the adoption of the Bamako Declaration[2] (cf attachment) on a fruit fly action plan in West Africa which outlines a roadmap of recommended actions required to ensure appropriate follow up to the initiative in the months to come.

The International Conference on Agricultural Investment is the next big landmark event that will help determine: (i) the extent to which ECOWAS Member states have mainstreamed activities related to fruit fly in their national agricultural investment compacts and whether ECOWAS has included fruit fly in its regional agricultural investment compact; (ii) the extent to which donors will respond to ECOWAS's Agricultural Policy compact in general, and to activities aimed at implementing the regional action plan to control fruit fly in particular.

Consultations with WTO-STDF and the World Bank point to a possible lag of approximately 1 year between the time that funds for the action plan are mobilized the actual start of implementation of activities. It is estimated to start at the beginning of 2011. For this reason, WAFFI seeks, through this project proposal, to extend the bridge funding it was offered for the 2009 season through a World Bank /STDF co-financing arrangement, for one additional year, until such time that activities under the regional action plan will start in earnest.

This proposal is also the natural continuation of phase I (World Bank funding using EU All ACP Trust Fund resources) and phase II (co-financing between the World Bank and the WTO/STDF) WAFFI initiative for the 2008 and 2009 mango seasons respectively:

- For the 2008 mango season, IITA benefited from financial support provided by the World Bank, which earmarked some of the funding received under the EU-funded all ACP Commodity Program to finance its horticulture-related activities. This funding enabled IITA and CIRAD, to start Phase 1 of a regional training program that encompassed seven countries in the sub-region. Although activities started late due to administrative hurdles, fruit fly trapping methodologies (centered around the use of GF-120, also known as Success Appat) were disseminated through a series of

[2] Find Bamako Declaration as attachment to this proposal.
http://www.standardsfacility.org/Fruit_Fly.htm

workshops involving plant protection personnel in the seven concerned countries, with field activities deployed around 45 pilot-orchards chosen in 15 of the most important agro-ecological zones for mangoes in the sub-region. To support this educational effort, a series of five technical brochures (N°= 1 to 5) were designed by IITA and CIRAD, in both French and English, and distributed at the various workshops and sent to the national Plant Protection Agencies.

- For the 2009 mango season, CIRAD-IITA benefited from financial support provided by the World Bank, which earmarked some of the funding received under the EU-funded project. For the first time, STDF also participated in this regional control program. The joint-funding enabled CIRAD and IITA, to pursue Phase 2 of a regional training program that encompassed eight countries in the sub-region. (Togo being the latest country to be part of this regional initiative). Thus activities have continued after phase 1 and still continue to-date. They are (i) monitoring of mango fruit fly trapping, (ii) fruit fly control (centered around the use of GF-120, also known as Success Appat), (iii) dissemination of information through a series of workshops involving the plant protection personnel in the eight concerned countries, with field activities deployed around 57 pilot-orchards chosen in 19 of the most important agro-ecological zones for mangoes in the sub-region. To support this educational effort, a series of five new technical brochures (N°= 6 to 10) were designed by IITA and CIRAD, in both French and English, and distributed at the various workshops and sent to the national Plant Protection Agencies and other scientists working on fruit flies.

Phase 3, for which financing is presently being requested (WB-STDF), intends to continue and deepen this regional sensitization and training work, and going one step further with activities in citrus pilot orchards. In 2010 the Program intends to cover eight countries (Benin, Burkina Faso, Côte d'Ivoire, Ghana, Guinea, Mali, Togo and Senegal). Activities envisage scaling up of the didactic effort before and during the 2010 mango season (February- August 2010), through training of trainers who, in turn, will be training growers, preferably through their associations, when they exist. As scientists and plant protection authorities recognize, long term control of fruit fly populations is mainly focused on Integrated Pest Management techniques (IPM-package). In this respect IITA-CIRAD will be disseminating throughout the region the use of the weaver ant as a natural agent to control fruit fly populations (Adandonon et al, 2009; Van Mele et al, 2007, 2009). Other dissemination will be the use of prophylactic method already tested with success in Benin during mango seasons 2008 and 2009.

It is important to maintain the momentum that has been gathered through the 2008-2009 exercises and carry it forward in 2010: DPV and SPV personnel has to be kept motivated, and clusters of growers, gathered around the 57 pilot orchards in 19 Agro-Ecological Zones (AEZ), have to be kept on board in order to propagate further the trapping detection and control activities. A break of our regional activities will be disastrous and will lead to a general discouragement in this fly issue. It is worth pointing in this respect that the WAFFI Phase 3 proposal is fully aligned with activities outlined in the regional action plan to control fruit fly in West Africa. The section on description of project activities below describes in full detail the link between this proposal and the regional action plan to control fruit fly in West Africa.

2. PROJECT JUSTIFICATION: Emphasizing the need for WAFFI's continuation

According to different publications and scientific articles, there is increased awareness of the continent wide reality of the fruit fly issue. The Bamako meeting has also contributed to the realization that responses have to be designed collectively and that the fight against fruit fly in SSA is an endeavour for the long haul. In this context, WAFFI is the only existing pilot project in SSA implementing a Fruit Fly fighting methodology, concomitantly conducted in eight countries that have agreed to follow the same applied research protocols.

The experience derived from this pilot program will be most valuable in shaping the implementation of the full scale regional program that will be in place by 2011, should the necessary donor funds be committed. This is why it is of the utmost importance that WAFFI be continued in the 2010 mango season, before the junction with a larger multi donor program can be made. To be sure that there will be no funding gap we have proposed the term starting from March 2010 to the end of February 2011.

2.1. DESCRIPTION OF PROJECT ACTIVITIES

2.1.1. Continuation of activities that had been initiated during Phases 1 and 2

- **Monitoring of fruit fly population fluctuations** (males) **in mango orchards** should be validated after several consecutive years of trapping. In this case it is detection trapping. This trapping should be continued, with several goals: (i) to have a better knowledge of the fluctuations of fruit fly populations in relation with the peak of fruit season, (ii) to be able to calculate and to use the Economic Injury Level (EIL), (iii) to implement the control measures at the right moment, ie before the outbreaks.

- **ToT, ToG and ToME workshops are still involving the training of trainers, of growers of pilot-orchards and some exporters** in order to have a real impact on fruit quality improvement at market levels (national, regional and international). The level of mango infestations by fruit flies vas quite lower during season 2009 as noticed by all growers involved in WAFFI's activities.

- **Dissemination of the use of the weaver ant for the biological control of fruit flies** in pilot-orchards and other surrounding orchards. The presence of weaver ants (*Oecophylla longinoda*) in mango trees reduced the damage caused by the fruit fly family Tephritidae through predation of adult fruit flies (rare), predation of third-stage larvae (quite frequent) and, especially, the effect of pheromones left by the ants on the fruit so that flies are repelled and are discouraged from egg-laying. Weaver ant presence resulted in a marked reduction in fruit damage. The influence of info-chemicals from predators such

as ants on the foraging behaviour of fruit insects and more generally on pests could have crucial consequences for future observations and applications on host selection and consequently in host protection against these pests. Practical information about the use of weaver ants in fruit fly pest control should be made available to all those involved in the fruit industry at every level, particularly local official producers, pickers, and rural advisors.

- **Focal points:** a **stronger network of focal points**
  The Phases 1 and 2 experiences showed how important the role of local coordinators is in ensuring the success of a project with a regional coverage. These focal points play an important role in keeping the momentum going and are the interface agents between the program and the local stakeholders. In 2009 the designation of these focal points has been reviewed in close consultation with each country's agriculture ministry and leading associations. Updating on this point was done in two countries Burkina and Benin.

2.1.2. New activities to be initiated during Phase 3 (with WB-STDF funding)

- **Dissemination of prophylactic control methods**
  It consists in (i) gathering punctured or fallen fruits, (ii) placing them in a black plastic bag, (iii) sealing the bag and placing it in the sun. The bag should have been checked to ensure there are no holes. After 48 hours, eggs and larvae of Tephritidae will be killed due to the high temperatures in the bag.

- **Monitoring of fruit fly population fluctuations** (males) **in another fruit value chain targeted: the citrus value chain** with detection trapping in five countries (in Senegal, Guinea, Ghana, Togo and also Benin). We have the same objectives as the monitoring of fruit fly population fluctuations (males) in mango orchards. As *B. invadens* is a common pest for mangoes and also for citrus species it is relevant to carry out the same activities in both mango and citrus orchards. Furthermore, we have mango and citrus orchards in the same areas and sometimes very close together.
  During the 2008 and 2009 seasons, we focused our activities on mango value chain. Another very important value chain in West Africa is the citrus value chain. With high concentration of vitamins and other nutriments it appears that citrus remain a very important production for West African populations. We are planning to launch preliminary observations of fruit fly infestations through detection trapping and loss assessment on different citrus species (*Citrus sinensis*, *Citrus reticulata, Citrus paradisi*).
  Why the Citrus value chain?
  In South Benin, from all citrus fruits sampled in 2008 - 2009, emerged fruit fly species were mostly *B. invadens* (98.3%) and the resulted damages depended on the locality and the citrus species. The recorded incidence on mandarin (*Citrus reticulata* Blanco) was 46.7% and 36.7% in orchards of Amoussa (Glo locality) and Monou (Sakété), respectively. On Tangelo, the incidence was 33.3% recorded in Amoussa's orchard. On sweet orange (*Citrus sinensis* L.) (cv Valencia) the incidence was 30%, 20%, 20% and 17.8% in orchards of

Amoussa, Agban (Allada), Houéssou (Allada) and Monou, respectively. In terms of infestation rate as number of pupae per Kg fruit, the recorded damages on mandarin were 25.6 and 22.4 in orchards of Monou and Amoussa, whereas these damages on Tangelo were 19.7 in Amoussa's orchard. On sweet orange, the infestation rate was 8.7, 7.0, 5.3 and 3.0 in orchards of Amoussa, Monou, Agban and Houéssou. This incidence level due mostly to *B. invadens* is an indication that, in South Benin, *B. invadens* is the most destructive and economically important fruit fly in citrus resulting in great yield losses. As the crop is an important income provider for the producers and then for the country, a proper control method elaboration is needed at any cost to reduce the yield losses, increase income and alleviate poverty.
In other countries as Ghana, Guinea Togo and Senegal the situation was the same than in Benin and sometimes it was worth.

- **Improvement of female trapping in both mango and citrus orchards.**
  An effort of research should be made to test and develop the best combination of trap-attractant in order to capture with a better effectiveness the females of fruit fly of economic interest such as *B. invadens*, *C. cosyra*…
  If male trapping of different fruit fly species gives good results in all AEZ and different types of orchards (mango and citrus) it is not the same for female trapping. Most of the times we often have the ratio 3/1 or even 4/1 between males and females captures. It is very important to get the same level of captures between males and females. Female trapping should be effective in order to efficiently manage fly populations. Some preliminary tests were carried out in Benin in 2005-2006. These preliminary results lead us to continue this work during season 2010 using different combinations of new traps and new attractants in order to improve the effectiveness of female trapping. In the same way we have a good monitoring of fluctuation of population of males we should also have a good monitoring of fluctuation of population of females in order to predict their main outbreaks before and during the season.

- **Communication with the unit of management** (= "unité de gestion"). The unit of management should be operational as soon as possible in order to have both Training-information-communication and Monitoring-evaluation of this project.

2.2. LINK TO ACTIVITIES PRESENTED IN THE REGIONAL ACTION PLAN TO CONTROL FRUIT FLY IN WEST AFRICA

Activities proposed in this project document are part of the vertical components (surveillance, pest management, applied research, capacity building) and also part of the horizontal components (training-information-communication and monitoring-evaluation) of the COLEACP report. The section below describes each activity in detail and provides the link with the regional action plan.

- **Activities 2, 2 bis : Monitoring of fruit fly detection trapping in orchards**

Description of activities 2, 2 bis: the monitoring of fluctuations of fruit fly populations will be carried out in both mango (8 countries) and citrus (5 countries) pilot-orchards (P.O.). The three main attractants involved in this detection trapping of fly species of economic significance are (i) Methyl-eugenol, (ii) Terpinyl acetate, (iii) Trimedlure. The objectives are (a) to estimate the fly populations in relation with fruiting seasons and the outbreaks of the fly species, (b) optimize the best time to launch control methods, (c) to define for each involved country the Economic Injury Level (E.I.L.) of *Bactrocera invadens* (Bi) and *Ceratitis cosyra* (Cc) as we have done before in Benin.

Link of these activities 2, 2 *bis* with regional action plan (Components Surveillance and Pest management): after several consecutive years, these monitoring activities concerning the two main fruit value chains (mango and citrus) in West Africa allow us to detect any potential outbreak of targeted flies (Bi and Cc). Furthermore, the continuation of use of Methyl-eugenol could allow us to detect any eventual introduction of *Bactrocera zonata*. Finally, with the definition of the tool E.I.L. we shall also be able to trigger best bets for fly control.

- **Activity 3** : **Improvement of female trapping in orchards**

Description of activity 3: previous experiments (2006-2007) on female trapping of *B. invadens*, *C. cosyra* in Benin gave us some results not fully satisfactory. If male trapping of different fruit fly species gives good results in all Agro-Ecological Zones (AEZ) and different types of orchards (mango and citrus) it is not the same for female trapping. Most of the times we often have the ratio 3/1 or even 4/1 between males and females captures. It is very important to get the same level of captures between males and females. Female trapping should be effective in order to efficiently manage fly populations

Link of this activity 3 with regional action plan (Components Applied research and Pest management): an effort of applied research should be made to test and develop the best combination of trap-attractant in order to capture with a better effectiveness the females of fruit fly of economic interest such as *B. invadens* and *C. cosyra*. Thus, pest management will be also improved.

- **Activity 4 : Dissemination of fruit fly management with weaver ants**

Description of activity 4: the presence of weaver ants (*Oecophylla longinoda*) in mango trees reduced the damage caused by the fruit fly (family Tephritidae) through (i) predation of adult fruit flies (rare), (ii) predation of third-stage larvae (quite frequent) and, especially, (iii) effect of pheromones left by the ants on the fruit so that flies are repelled and are discouraged from egg-laying (Adandonon et al, 2009; Van

Mele et al, 2009). Weaver ant presence resulted in a marked reduction in mango fruit damages (Van Mele et al, 2007).

Link of this activity 4 with regional action plan (Components Pest management and Capacity building): the biological control of fruit flies using weaver ants is very effective, economic (i.e. self-regenerating), and general in West Africa because weaver ants are widespread in West Africa. As many growers don't know the real importance of these native natural enemies practical information about the use of weaver ants in fruit fly pest control should be made available to all those involved in the fruit industry at every level. It concerns particularly all the growers and their workers, pickers, rural advisors and trainers.

- **Activity 5: Dissemination of prophylactic methods**

Description of activity 5: This control measure is essential in fruit fly management. It consists in (i) gathering punctured or fallen fruits, (ii) placing them in a black plastic bag, (iii) sealing the bag and placing it in the sun. The bag should have been checked to ensure there are no holes. After 48 hours, eggs and larvae of Tephritidae will be killed due to the high temperatures in the bag.

Link of this activity 5 with regional action plan (Components Pest management and Capacity building): this is the first step in fruit fly management in mango orchards. Previous studies (2008-2009) provided us good results and show us the complementarity of this control method with others through a synergist effect. Practical information about these prophylactic methods in fruit fly should be made available to all those involved in the mango industry at every level. It concerns particularly all the growers and their workers, rural advisors and trainers.

- **Activities 6, 7, 8: Training of trainers (ToT), growers (ToG) and mango exporters (ToMG)**

Description of activities 6, 7, 8: these activities will consist in passing on information to participants through powerpoint presentations, posters, distribution of technical leaflets (10) and field visits. The staff involved in these training sessions includes (i) trainers (ToT), (ii) growers (ToG) of pilot-orchards and (iii) main exporters (ToME). In each West African country it concerns about 20 trainers, 25 growers and 10-12 exporters.

Link of these activities 6, 7, 8 with regional action plan (Components Capacity building and training-information-communication): reinforcement of capacity of trainers-growers-exporters through training-information-communication is essential for reaching the goals of this project. Trainers and exporters have good understanding of the threats that fruit flies represent for fruit export and good management of the pests. Participation of growers is also very important through the dissemination of best bets around their orchards.

- **Activity 9: A focal point appointed per each country**

Description of activity 9:
The reference terms of the focal point of each country are:

1. Participate in workshops, symposiums, conferences and other meetings in relation with fruit fly issue in each West African country.
2. Take active part of meeting of National Fruit Fly Control Committee (with all actors).
3. Plan regular monthly visits in all different pilot-orchards of each agro-ecological zone to be sure that protocols are well-followed, in order to collect data and meet growers needs.
4. Send to the regional coordination:
    - Weekly captures of fruit flies,
    - Outputs of control actions,
    - Samples of flies if necessary,
    - Minutes of meetings...
5. Organize the missions of the regional coordination in their country.

Link of this activity 9 with regional action plan (Component Training-information-communication): each focal point can assure the execution of all planed activities of the project in each involved country. He also participates in each training sessions in his country providing information and communication for all staff of mango and citrus value chains.

- **Activity 10**: **Communication with the unit of management**

Description of activity 10:
The unit of management will be under ECOWAS supervision. There will be regular information exchange between them and us.

Link of this activity 10 with regional action plan (Components Training-information-communication and Monitoring-evaluation): this communication will update the project information to the unit. Monitoring and evaluation of the different activities of WAFFI 3 should be timely done.

3. IMPACT OF THE PROJECT

The impact of WAFFI should be to contribute toward to the objectives set out in the regional action plan to control fruit fly as follow:

General objective

Raise incomes of fruit and vegetable producers, particularly small producers, thus contributing to poverty reduction.

Specific objectives

Control losses on fruit and vegetables due to fruit fly infestation, so that they are no longer a constraint on mango exports

Increase the quantity of fruit free from infestation available for sale on the local market, to contribute to improving food security.

For this result, in order to homogenize the knowledge and the pieces of information, the project will build an operational network with active national fruit fly control committees as key points able to spread information and new techniques towards growers association, but also to gather results and other information from the fields toward the Research partners.
Dissemination and training products will be developed to link efficient pest management technologies to various field conditions.

It has to be reemphasized that Phase 3 will use and consolidate the network of the 57 pilot-orchards (3 in each of the 19 chosen Agro-Ecological Zones) that has been set up during Phases 1 and 2.

It is estimated that the exercise should span a period of 12 months, i.e. beginning of March 2010 till end of February 2011.

Composition of annexes:

> In the **Appendix 5**, we have:

(i) the objectives of the Program,
(ii) the verifiable indicators,
(iii) the means of verification,
(iv) the important assumptions which have been described.
This logical framework involves both related activities. In this annex we have our main outputs.

> The **Appendix 7** shows a global monthly timetable with expected outputs with WB and STDF funding. The outputs are evaluated every three months most of the time.
Some precisions:

- Prophylactic control methods are only necessary before and during the mango season: it is the reason we have six months without activity (from July to December). Thus, these activities are focused during the first six months of the year with local adaptations if necessary.
- Training of trainers (ToT), training of growers (ToG) and training of exporters (ToMG) are only scheduled before the mango season: it is the reason we have only three months with these training activities.

> The **Appendix 8** presents the WB-STDF Financial Proposal including the CIRAD' involvement for the coordinator's cost. We can stress that we have our different objectives in relation with the different components of the Regional Action Plan (cf Plumelle et al. report, September 2009).

Glossary of terms used in this proposal

> Identification and characterization of pilot-orchards (PO)

Candidate pilot-orchards are selected as exemplifying major cropping systems or agro-ecologies, where mango fruit flies have already been identified by growers as a principal concern; other bio-physical and socio-economic features of the site have already been (or are at least in the process of being) characterized; promising new IPM options have the potential to achieve a decisive improvement; existing R4D activities provide a platform for pilot site development; opportunities exist for achieving new synergies by closer collaboration between partners; a wide extrapolation domain can be identified for the results of pilot activities; effective national partners can be identified to take primary responsibility for propagating these results.

> Conduct Training of Trainers (ToT)

This aims to develop a cadre of national experts in mango IPM. Select training participants (mainly national extension agents, field agents of NGOs and the private sector), assess their training needs and conduct field-based training in the principles and practices of mango fruit fly control.

> **Conduct Training of growers (ToG**)

This aims to develop a panel of different growers for each Agro Ecological Zone (AEZ) representative of their chain fruit production (mango and citrus).

> Provide specialized training of mango exporters (ToME)

To provide private sector with skills required to identify fruit flies in the product that they buy; avoid contamination of mango product meant for export; and avoid pesticide contamination of the product.

> **Agro Ecological Zone (AEZ)**

An Agro Ecological Zone is a mapping unit resulting from climatic, pedological and phytosociological data. This unit has different constraints and specific capacities related to the land use. They can have also different components about fruit fly species bio-diversity in relation with different fruit seasonality.

APPENDIX 4: Project management

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Focal points of WAFFI

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